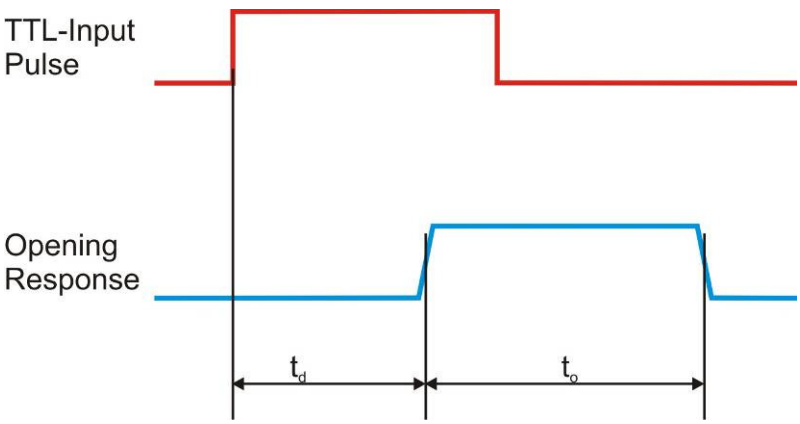
Millisecond Shutter Manual V04 (preliminary)



1. Parts

- Shutter (different versions: 2mm / 4mm / air / HV / special)

- Driver-Box:

- Connection Cable
  coil: Pin 1 and 2
  coil: Pin 3 and 4

Opening
Closing

2. Tools

3. Build together the shutter

1. Attach some Kapton tape to the shutter blade, and cut it properly.
   The reason is that the blades becomes permanent magnetic over time, and without the tape it might sometimes not come off the coil any more. This depends fully on the thickness of the coating of the blade which might vary.
   If the shutter is commissioned, it has this tape already on.

Kapton® tape, 3/4" wide, 0.0035 inch thick, with silcone adhesive.
www.accuglassproducts.com Part Number 111201

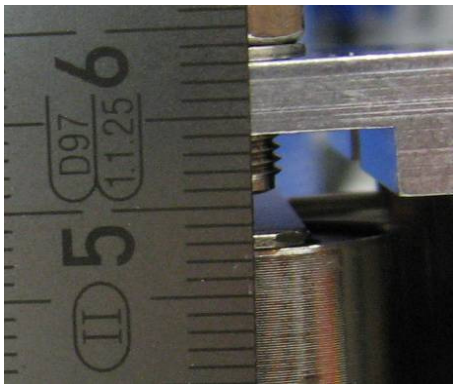
Materials	Kapton, Silicon Adhesive	
Max. Bake Temperature	260°C	
Max. Operating Temperature	260°C	
Min. Operating Temperature	-75°C	
Max. Vacuum Level	$1x10^{-10}$ Torr	
Contact Material	Silicone adhesive	
Length / Height	36-Yards	
Width	0.750	19.05mm
Depth / Thickness	0.0035	88.9um

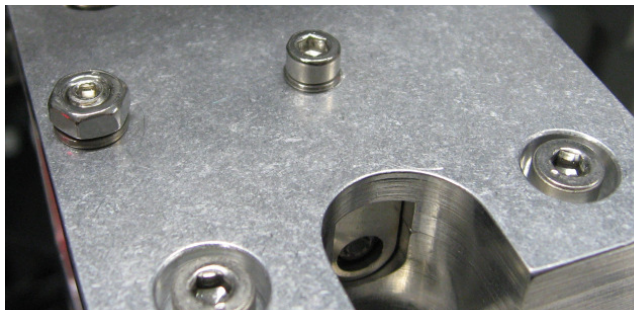
2. Adjust height of ‘opening coil’, with the attached M5-screw and its nuts.
   The blade should become as horizontal as possible, and it also should touch the coil as flat as possible.

First use only the top nut to fix the coil, then if the height is correct use the bottom coil (and also a spring washer) to fix everything tightly together.

3. Adjust the fastening screw on top of the shutter in a way that you get the shutter aperture you like. (2mm or 4mm or in between). There is 0.5mm ‘dead’ area at the edges, because some bouncing of the blade.
   Therefore: 1mm beam → 2mm aperture.

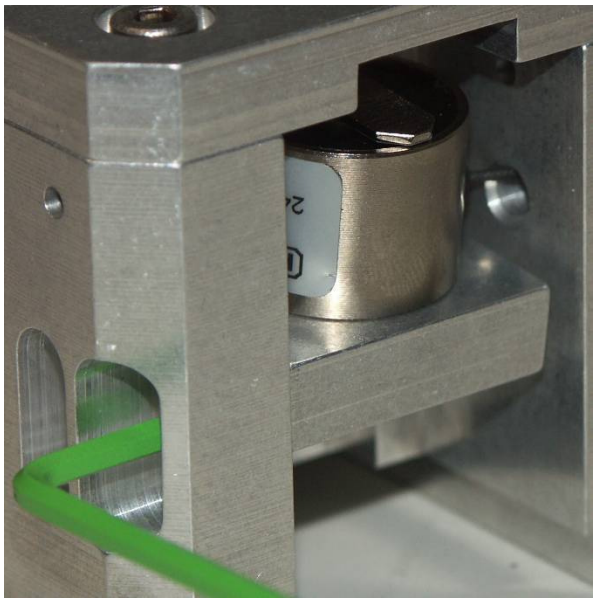
   Use spring washers for this top screws to make the screw withstand the permanent vibrations.

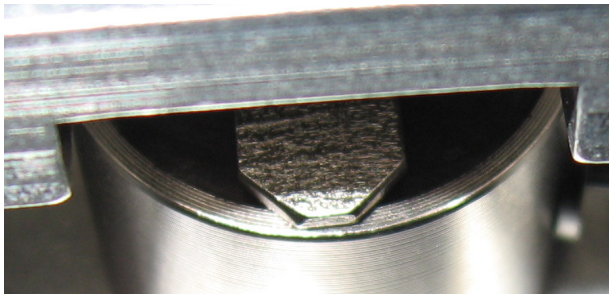




4. Adjust the ‘closing coil’ to comply to the following 2 conditions:
   - blade touches fastening screw (on top of shutter)
   - blade touches ‘closing coil’ (flat overlying)

   Fasten the M3 screws very carefully (little bit one, then the other, then the first again) otherwise the coil-holder block will rotate.
   Also make sure the blade is really touching the coils border. (Push coil towards center of the shutter while fixing).





5. Check if the blade can easily move around.

4. Known Problems

Blade sticks to a magnet
In some cases it can happen that the blade sticks to one magnet and one cannot open/close the shutter any more.

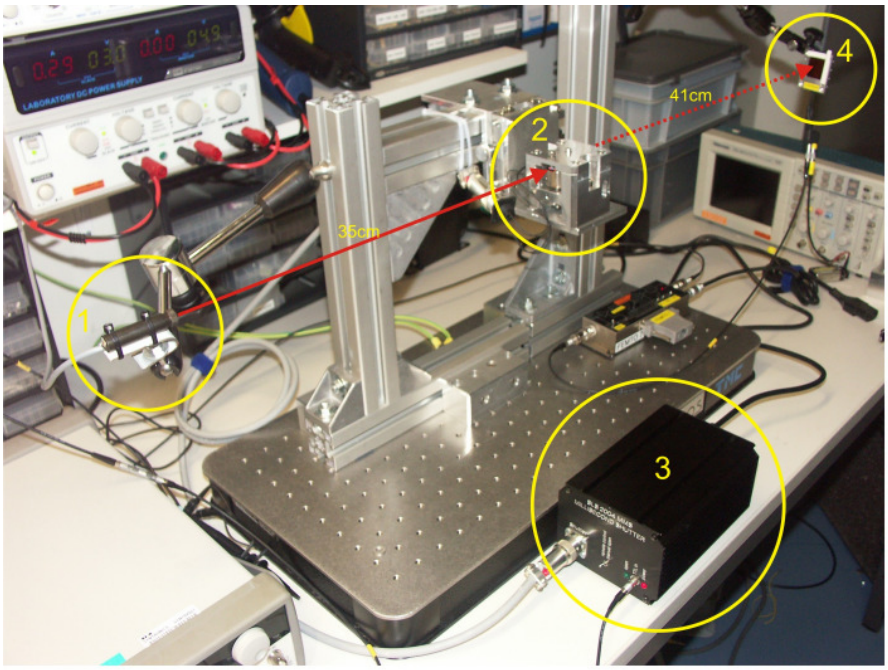
- Clean the blade with alcohole and also the surface of the magnet.
- If this doesn't help, one might look at the length of the 'opening' and 'closing' times with a scope, see chapter "Electronically adjustment of shutter-driver".

5. FAQ's

Electronically adjustment of shutter-driver

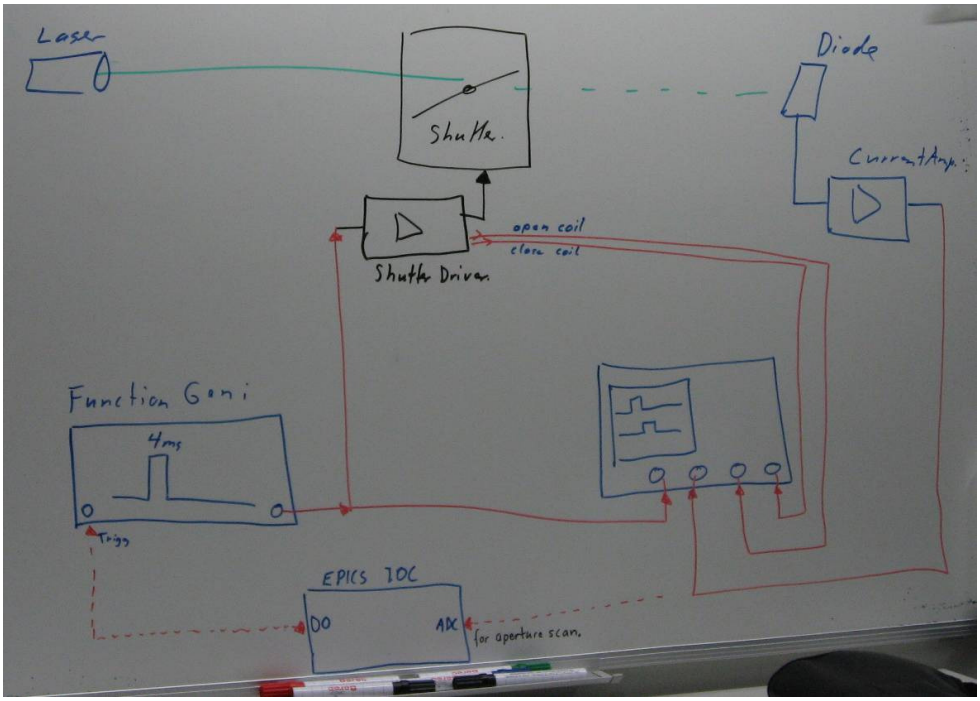
Please see “shutter specifications detailed” for the values one has to achieve.

1. Build a setup similar to the one described here:
   Laser -----> 35cm -----> shutter -----> 41cm -----> diode

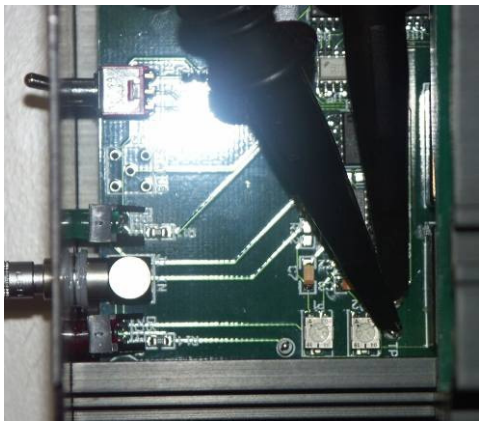


1 Laser 2 Shutter 3 Driver 3 Diode

The laser-beam should be as horizontal as possible, to give a realistic response.



2. Attach a 4-channel oscilloscope in the following way:
   - CH1: TTL-Signal (from any frequency-generator, 0 ≤ signal ≤ 5V !)
   - CH2: Signal of diode after the shutter (usually over a current-amplifier)
   - CH3: TP1 inside the shutter (signal to the ‘opening-coil’)
   - CH4: TP2 inside the shutter (signal to the ‘closing-coil’)

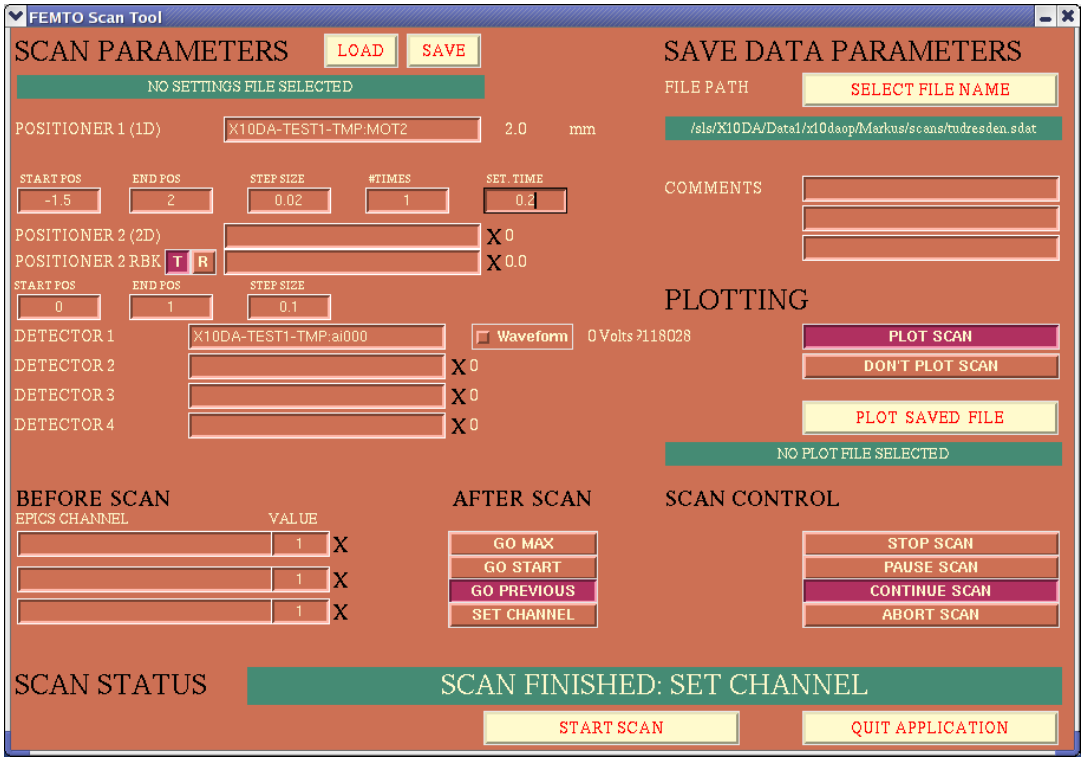


4-channels scope picture

3. Adjustment of the potentiometers for the duration of opening and closing.
   - P1 ‘opening’, pink (adjust until opening jitter is minimized)
   - P2 ‘closing’, green (adjust until specified repetition rate is achieved)
   usually in the range of 1..3ms depending on the shutter.

Attention High Voltage
Careful on the wires to the coils there are for several milliseconds > 100VDC!

Scan the aperture of the shutter. (EPICS)



6. Beam path / Absorption

The shutter blade consists of steel.
2mm-Version: ~12mm steel (absorption length)
4mm-Version: ~ 6mm steel (absorption length)

Beam height from mounting floor:
2mm-Version: 49mm
4mm-Version: 50mm